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ABSTRACT

In order to develop an ecological theory of teaching, the classroom must be viewed as a sociological unit. The unit of interest was the teacher-student learning group. The basic question explored was: What is the relationship between human interactions and the physical and social contexts of the group? Teams of scholars met in seminars, each member bringing the concepts and perspectives of his respective discipline or area of inquiry. In this "bridging report" two researchers combine different approaches to contribute to an ecological theory of teaching. One brought to the study his "activity structures" perspective which considers the social-cognitive learning outcomes and behavioral patterns which accompany the structure of learning situations. The second emphasized the effects of the physical environment of the classroom on human behavior. (JD)

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Ecological Theory of Teaching

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BRIDGING REPORT 1

Bridging the Research of

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BRIDGING REPORT 1'

Introduction

This is one of a series of reports by the Far West Laboratory for Educational Research and Development (FWL) concerned with developing an ecological theory of teaching. Under funding by the National Institute of Education, the project has been underway since December 1977 and is projected to continue contingent upon funding from NIE.

The uniqueness of the program lies in four undergirding assumptions. It is proposed that by attending to each, educational R&D needs which to date have received little attention will be accommodated. These are:

- The need to develop a theory which *views and explains classroom teaching and learning as sociological in nature.* This contrasts with and adds to current theories which are primarily psychologically-based.
- The need to develop a theory that it is *grounded in and emerges from the realities of ongoing classroom life,* incorporating teachers' understandings of their own worlds. To date, theories about schooling have been based for the most part on explanatory models that are derived from other settings, e.g., diagnosis and prescription (from medicine), input-output (from industry), PPBS (from the military), etc.
- The need to apply and capitalize upon the perspectives of multiple appropriate social sciences in order to understand more fully classroom life. Psychology has been the dominant discipline in educational R&D. *A multidisciplinary approach*

will add the unique and diverse perspectives of other fields, e.g., human ethology, sociology, environmental social-psychology, anthropology, human ecology, etc. to the research efforts.

- The need to attend to and apply research methodologies appropriate to inquiring into specific questions while maintaining high standards of excellence. *Methodologies drawn from the disciplines within the social sciences cited above will add to current research repertoires,* thus making possible selection from more than a single paradigm for inquiry.

To carry out this program, four long-range goals have been proposed. These are:

(1) To develop a theory that approaches and explains what goes on in teacher-student learning groups from an ecological perspective. Such a perspective goes beyond the teacher-single student dyadic paradigm pervasive in most current educational research. In addition, it attends to the myriad of complex variables that combine to explain *how human interactions shape and are shaped by the physical and social context of the class unit (teacher-student learning group).*

(2) To examine, modify, and/or create *research methodology that accommodates a multivariable, multidimensional, multiperspectival theory and makes possible inquiring into its operationalization in naturalistic settings.* In particular, such methodology must serve to capture the interrelationships among these variables while maintaining the integrity of ongoing classroom life.

(3) To survey, adapt and/or generate *training/development strategies that engage teachers, students and relevant others in applying an ecological perspective to classroom teaching and learning.* Traditionally, teacher training has been based primarily upon psychological theories of how individuals learn. It is anticipated that training/development strategies that focus instead on the sociological nature of human interactions while attending to the total ecology of the classroom will be useful.

(4) To test the theory by conducting a *restructuring experiment in nature.* Such an experiment would (a) implement in the natural setting of a school the teaching/learning strategies which build from the theory, and (b) study their effects by applying research methodologies which will have been developed concurrent with theory development.

To guide the effort, a Seminar of Scholars was organized. Composed of scholars from disciplines not usual to the educational research enterprise as well as those engaged in it, the Seminar serves both to inform theory development and to review and critique ongoing project activities.

At the initial meeting in San Francisco in May, 1978 the seminar participants reviewed reactions to a draft document which presented working definitions of those theoretical constructs proposed by the principal investigators as critical parameters for theory development. (Prior to this meeting, the document had been reviewed and critiqued by eleven experts with diverse perspectives, including members of the seminar.) From these deliberations emerged a consensus that the unit of interest for anchoring the theory is

how human interactions shape and are shaped by the physical and social contexts of the teacher-student learning group. To explore how elements and interactions among elements contributory to understanding and describing how such a unit of analysis might be identified or generated, it was recommended that, as its next step, the FWL staff undertake a series of *bridging activities.*

Bridging activities are designed to bring together two or more scholars with diverse perspectives in order to provide opportunities to create intellectual *bridges* between the concepts and perspectives of their respective disciplines or areas of inquiry. As participants in the activity, scholars are asked:

(a) What does your own research, as well as the research knowledge of your discipline, have to offer an ecological theory of teaching in terms of findings, concepts, or methodology?

(b) What further information is required and what additional methodological concerns need to be addressed to enable your own research to be considered *ecological* according to the working criteria established by the Seminar of Scholars?

(c) In combination, what do your areas of research suggest as important variables and combinations of variables to consider in building the theory? What do the combined fields suggest regarding methodological issues and procedures to be considered in designing the inquiry strategies to be used in building a "grounded" theory?

FWL investigators participate in these bridging discussions and serve as facilitators and recorders. Following each session, they draft a document which reflects the outcomes of the bridging session. This document is read

and revised by the bridging participants, and, as appropriate, additional statements are included. The final product is exemplified in this report, one of a number completed or in process of completion.

The experience of bridging the ideas of two or more scholars has proven to be immeasurably valuable to the ongoing development of an ecological theory of teaching. Bridging activities provide an exciting arena for interaction among persons who otherwise might not juxtapose their knowledge for purposes of systematic inquiry. The result of their interaction delineates variables and raises questions for further inquiry which in themselves inform theory development.

A report follows of the knowledge, insights, and recommendations obtained through one of the bridging activities. The purposes of and participants in this particular activity are presented. The findings that emerged from the deliberations are reported. This latter discussion includes four areas of interest: (1) a review of the contributions to an ecological theory of teaching of each research base; (2) some thoughts on activity structures and ecological theories; (3) a discussion of areas of inquiry to be pursued in order to build an ecological theory of teaching that is grounded in the realities of the teacher-student learning group based on the combined perspectives of the two researchers; and (4) methodological concerns and procedures that emerge from and support the constructs presented in the previous discussions.

Purpose and Participants

As noted above, the May 1978 meeting of the Seminar of Scholars proposed that scholars from varying disciplines be brought together in "bridging groups"

to explore the following question:

How human interactions shape and are shaped by the physical and social context of the teaching-student learning group.

The Seminar of Scholars felt that this multi-disciplinary exploration would further the theoretical elaboration of concepts and variables related to this question in order to move toward the development of an ecological theory of teaching.

In response to this charge, Dr. Steven T. Bossert, of the University of Michigan, and Dr. Franklin D. Becker of Cornell University, met for three days with William J. Tikunoff, Beatrice A. Ward, and John R. Mergendoller, all of the Far West Laboratory for Educational Research and Development.

Dr. Bossert brought to these discussions his "activity structures" perspective which considers the social-cognitive learning outcomes and behavioral patterns which necessarily accompany the structure of learning situations. His studies of this aspect of the "hidden curriculum" are well known in the fields of sociology and education (Bossert, 1977, 1978, forthcoming). Dr. Becker's background is in environmental and social psychology, and complemented the structural perspective of Dr. Bossert. Dr. Becker's research has ranged from evaluation of the social and behavioral consequences of different housing, school, and urban environments to studies of crowding, human territoriality and spatial behavior, environmental meaning and user participation, and the effects of different types of classroom seating arrangements on student participation (Becker, 1973, 1974, 1977, 1978).

Contributions to an Ecological Theory of Teaching

Although the discussion utlimately focused upon consideration of the questions raised in Dr. Bossert's paper, preliminary discussion raised interesting

ideas, presented findings of previous research, and allowed dialogue at specific bridging points where both discussants reached the same conclusion from slightly different approaches.

Dr. Becker's overview of aspects of environment-behavior relationships is summarized by his following general comments. How he and Dr. Bossert saw these ideas and issues relating more specifically to Dr. Bossert's concept of activity structures is presented under Future Areas of Inquiry. Dr. Becker's comments include:

- Physical and social systems influence each other. They may be congruent or incongruent, but they do not operate independently. When you change the physical system you are simultaneously operating on the social/administrative system.
- The physical environment can be construed as an opportunity system, i.e., it facilitates or frustrates activity and interaction patterns. It may do so by virtue of physically limiting certain kinds of behavior, or by supporting expectations about whether certain behaviors are appropriate, desirable, or feasible. For example, teachers may treat movable furniture as though it was part of a "fixed-feature" system, thereby limiting or making certain teaching approaches frustrating and difficult. Both the type and arrangement of furniture and equipment may also be interpreted as reflecting administrative or faculty teaching philosophies and attitudes toward students when, in fact, their primary determinant may be custodial convenience. The physical environment becomes part of a nonverbal communication system, with possibilities for misunderstanding occurring among all occupants of the setting.

- At certain levels of behavior, physical characteristics of the setting override individual difference characteristics, i.e., the power of the physical setting and its attendant normative structure may create "standing patterns of behavior" which persist even when different individuals occupy the setting. In other words, structural characteristics of the setting may play a more important role than some of the individual characteristics of teachers or students.
- Issues of control, reflected in concepts such as privacy, territory, and crowding, are generally central in any social grouping and play a role in structuring and supporting different types of social interaction and social behaviors. For example, high density in dormitories has been related to less cooperation and greater avoidance of any type of social interaction, even in settings outside the dormitory. Paradoxically, then, desired social interaction appears to be related, in part, to achieving privacy. Physical characteristics of some settings are "sociofugal" (tending to separate people from each other) while others are "sociopetal" (tending to bring people together). Attention needs to be paid to the kinds of activities one wishes to promote in a classroom and to the social characteristics of the space, in terms of the kind of interaction opportunities it provides.
- The process through which environmental changes and decisions are made may be as important as the consequent characteristics of the physical settings. In particular, personalization and the users' manipulation of their physical surroundings may play an important role in students' and teachers' sense of security, identity, and self-esteem. How environmental change is managed in the classroom may also affect

students' attitudes toward environmental change and conditions outside the classroom by providing them with "metamessages" or tacit learning about whether active or passive responses to unfavorable environmental conditions (e.g., in the classroom, these might include lighting, furniture arrangements, type of equipment, etc.) are appropriate or "morally correct." Perceived control may be more important than actual control both in reducing stress and in the kinds of adaptations made.

- Attention should be paid to the kinds of stress induced under different kinds of environmental conditions (e.g., density, classroom arrangement, location of educational services, types of equipment and furnishings), the types of adaptations made to these conditions, and the social and learning consequences of different coping strategies. It is possible that stress may be quite low in the classroom but that the costs of adapting to unfavorable environmental conditions have been high (e.g., there is no conflict among children doing different types of activities because all potentially conflicting activities have been prohibited, thereby limiting learning opportunities).

Dr. Bossert's remarks, which follow, incorporate an earlier definition of *activity structure*, which was presented at the May, 1978 meeting of the Seminar of Scholars.

The concept of *activity structure* is defined by several dimensions: (1) grouping of students; (2) number of different tasks; (3) interdependency (Is the production of the task dependent upon someone else's performance?); (4) choice (Is the task organized by the student or by the teacher?); and (5) evaluation (Is the evaluation public or private, comparable or non-comparable?). Dr. Bossert has identified three types of activity structures:

(1) recitation; (2) class tasks (where everyone is doing the same thing but not in a recitation format); and (3) multi-tasks. All teachers use some percentage of each of these three types of activity structures.

Within these activity structures, teachers and students interact. One observes individual behavior, but at any moment, one also can typify the activity structure. For example, there may be five groups, each using different materials, but all run by recitation. This is distinct from the activity (what is going on in each of the recitations) which is the structure. During recitation, certain *forms of behavior* are likely to occur. It is, therefore, the crystalization of a patterning of the behavior that is termed an activity structure. The structure may persist over time with different actors and, hence, is analytically separable from specific interactions observed at any one moment.

It appears that differences in activity structures will set up different student roles and perceptions. People don't just react, they interpret and construct their own reality. For example, among students, the meaning of friends changes with different activity structures. In recitation structures, friends are peers that can help one another with the assigned work. Whereas in multi-task situations, friends are those peers with common interests irrespective of their ability to maintain performance standards.

In making particular structures operable in the classroom, teachers have agendas, students have agendas, and these agendas get negotiated. Teachers may set up structures, but students redefine them. The social system of students is powerful and may force redefinitions of the teacher's original structures. There are parameters in the social organizational features of schools which shape teacher's agendas, and shape acceptable agendas which children can come in with.

Teachers often use different activity structures for high tracks and low tracks. The extent to which teachers' perceptions influence such decisions are interesting in two respects. First, perceptions key teachers into the use of certain resources and certain activity structures; secondly, different activity structures provide different data for the teacher and encourage different conclusions. For example, in recitation, social performance is generally confused with academic performance. Moreover, whether a teacher is standing in front of a recitation group versus circulating among a group of independent students, he or she is going to get different data about those students, and will make different inferences about how they are doing.

Given these features of activity structures, the relationships between this perspective and the perspective of an ecological theory of teaching are of interest. In preparation for the bridging effort, Dr. Bossert prepared the following discussion regarding how activity structures might be viewed within an ecological perspective.

Some Thoughts on Activity Structures and Ecological Theories

(prepared by Dr. Steven T. Bossert)

I think there is substantial compatibility between the activity structures and the ecological perspectives on teaching. Most importantly, both include a concern for the reciprocal nature of social relations and for the crescive properties of social structure. An activity structures perspective centers attention on the social organization of the learning context. It rests on the observation that teachers and students make judgments about themselves and others, interact and form social ties, and experience social sanctions within the context of recurrent activities (what they are doing). The structure of activities shapes the students' exposure to particular curriculum contents, the

distribution and use of resources, the pedagogical decisions that teachers make, the meaning and effect of social influence, and the exercise of teacher control. These, in turn, affect what children learn.

The ecological perspective also focuses on these properties, particularly how roles are enacted within the context of interpersonal relations and activity. However, the major difference seems to be that it includes the setting or "physical and material conditions" (to use the nomenclature of Steven Hamilton during the May 1978 Seminar of Scholars meeting) as important features to consider in explaining behavior. As Walter Doyle has indicated, the activity itself is experienced within an environmental setting characterized by features which contribute substantially to the complexity of social interaction. Yet, exactly how environmental effects occur is often unclear to me. Usually, the setting or resources are seen as constraining. The room is too small; there are not enough books to go around; etc. This is (as Hugh Mehan notes) a strongly deterministic point of view and does not clearly explain how actors construct the environment to meet their own needs. Nor does it address how environmental conditions obtain their meaning for actors.

The most obvious ecological "addition" to an activity structures perspective would be the environmental conditions in which the activity structure is contained. It is easiest for me to see how the physical features of the setting, the available material resources, and even the compositional characteristics of the student group shape which activity structure "gets into place." For example, entire class instruction in reading may not be operable when there are only one-third the required number of similar textbooks. Therefore, a teacher's choice of what to do may be shaped by his or her perceptions of the physical and social characteristics of the setting. In part, this can be

examined by studying the factors which influence teachers' classroom plans: What things affect teachers' choices (intentions) about classroom activities? Some of these things will be features of the school's activity structure--the time schedule, attendance reports, committee work, teaming, principal's observations, testing, conferences with parents, and the like. Other things, such as room size, access to materials and facilities, sound-proofing, and the compositional characteristics of student groups should have independent effects.

Another part of the "ecological effect" on activity structures is in how the setting shapes what the teacher is actually able to implement. What goes on in the classroom is not simply the acting out of teacher plans. Moment-to-moment decisions may be influenced by the ecology of the teaching setting in two ways--directly by the physical constraints on action and the materials at hand, and indirectly by the responses students have to these physical and material properties of the classroom. I have not been able to generate a list of such effects because I do not know the research literature in this area, nor have I examined these properties in my own classroom research.

To my mind, however, environment/setting factors have their main effects in interaction with the activity structure. The meaning of an environmental feature, and hence its effect on behavior, derives from its relation to an activity or an intended activity. For example, room size may have different meanings and consequences for recitation and for small group/individualized projects. A small room may keep the class focused on the teacher and chalkboard in a recitation structure whereas it would detract from the focus of a small work group as sound from other groups impinges on children's concentration. Another example, one that I have experienced, concerns the glare from windows onto a chalkboard. This may preclude the use of some space, forcing the teacher

to pace the lesson to the slowest note taker or copier (without the ability to write ahead), thus severely decreasing the amount of material covered in one lesson. However, this environmental effect only occurs when instruction involves large group, written or lecture formats. The activity structure, therefore, *conditions the consequences* of the setting characteristics. One cannot simply assume that the existence of physical/material properties produces the same effect; one must look at how these interact with the activity people are engaged in.

To study the effects of setting on teachers and students, perceptual data and comparative studies seem important. In examining teacher plans, perceptions of the constraints and determinants of actions would be useful because little is known about how these perceptions are formed (outside of the effect of curriculum objectives). Comparative studies of variations in plans that are formed in "ecologically similar" situations would indicate the limits of conditional parameters on the teacher. Likewise, to study the effects of classroom environment on teacher acts, one could follow how teachers with similar intentions (plans) acted in different settings. What are the adaptive processes in operation? In doing these investigations, I am not sure that teacher and student perceptions should be the only data. While they are useful, they cannot give a full picture. People are not always aware of the factors which shape their opinions. In the case of setting effects, the material conditions may "make" an actor "see" things in only one way so that he is not aware of options. Therefore, natural experiments may be the best way to test ideas about these relationships.

Future Areas of Inquiry

Building from the "bridging" discussion and the comments prepared by Dr. Bossert, a *shared* conceptual framework was developed. This framework is presented below in diagram form as a prelude to the exploration of future areas of inquiry.

Within the classroom, one observes patterns of interaction among teachers and students. Interaction patterns (some of which can be frozen in time and identified as *activity structures*) are influenced by and influence the physical environment. In turn, interaction patterns influence normative and academic outcomes. As an example, one could consider the teaching of reading through recitation. In the first place, the physical environment (the size of the classroom, the density of the student population, the physical resources and furniture available) may affect the specific pattern of interaction observed during recitation. (It is unknown, however, how this pattern will be affected.) Similarly, the activity of recitation may occasion rearrangement of furniture (and persons) and the utilization of certain special materials. In this way, it influences the physical environment. In the process of this interaction among the teacher and students, learning occurs; there are normative and academic outcomes. Although traditional educational research has focused on the academic outcomes of this activity, it is clear that normative learning is also occurring. Children are learning what is considered morally *correct;*

they perceive that "good" children behave in a certain way. Moreover, they are learning social norms which transcend the particular setting of the recitation reading group. They are learning, for example, that one does not talk when another person is already talking. Finally, they are learning social and academic procedures: e.g., to go to the bathroom, one raises one's hand; to take a turn in reading, one also raises one's hand. These learnings are particular to the setting and do not have the universality of the social norms that also are learned. These normative and academic outcomes, both as goals and as processes, influence the interaction patterns which occur. If the teacher feels it imperative to teach certain procedures, then this will structure the interactions which are permissible. Similarily, a student's attainment or non-attainment of a goal will have consequences for the way in which a student approaches a task, and the way in which he or she interacts with other students and the teacher. Certain desired learning outcomes may necessitate the rearrangement of the physical environment in order to accommodate the class interactions deemed necessary by the teacher; conversely, characteristics of the physical setting, such as the arrangement of chairs, may influence the choice of learning outcomes that will be emphasized in a particular structure.

The arrows in the above diagram connote a static quality; in actuality the parts of the diagram are in constant, fluid interaction, with each part of the diagram affecting and affected by every other part.

Further explication of this conceptual framework by Drs. Becker and Bossert led to consideration of constructs that warrant additional investigation. These include:

Physical Environment

Parameters: 1. Density

2. Spatial Arrangements
   a. Within classrooms (furniture and shape of room)
   b. Within schools (relation of services to each other; length, characteristics, location of, and other linkages among settings in the school)

Observable Behaviors
(Can also be considered behavioral outcomes of classroom activity structures)

1. Functional Segments of Classroom Life
   a. Transition
   b. Preparation
   c. Activity
      1. Academic learning
      2. Play
      3. Administrative tasks

2. Dimensions of Observation
   a. Patterns of movement (physical elements and people)
   b. Space utilization
   c. Human interactions
      1. Direct social contact
      2. Indirect (vicarious) social contact
      3. Allowable choices
      4. Rule setting and social sanctioning
      5. Interpersonal and self-evaluation

Secondary Outcomes

1. Academic learning
2. Normative learning
3. Perception of self and others in terms of...

Each of these constructs is discussed below. Dr. Becker's thoughts provide the basis for the treatment of the physical environment. The discussion for the other constructs is based on the combined input of both Dr. Becker and Dr. Bossert.

Definition of physical environment. The physical parameters listed above are by no means the only ones that may affect classroom activity. Others which could be included are noise, temperature, lighting, and general architectural ambience (e.g., quality and type of finishing materials, colors, style of

furnishings such as soft seating vs. hard seating, etc.). The ones defined here are selected because they: (1) have received more attention in the environmental psychology literature than the others, at least in relation to classroom settings; (2) they are "relatively" easy to observe and measure; and (3) they are likely, based on the literature, to have a greater impact on classroom teaching and learning activities than some other environmental variables.

Definitions of two basic categories of physical environment variables--density and spatial arrangements--are considered.

Density. The construct of density is selected rather than "crowding" since the former is a physical measure while the latter is subjective, based on an individual's perception of others. Several different ways to measure density exist, with no one definition inherently better than the others. In the proposed research, it would make sense to employ more than one definition so that the differences that may exist as a function of different definitions could be examined. Possible definitions include:

- The number of people in a classroom; i.e., the total number of people present with no consideration given to their specific grouping or location within the class. Density could then be increased in two ways: by increasing the number of individuals in the same size classroom (social density), thus holding the square footage constant; or by varying the square footage of the class and keeping the number of individuals constant (spatial density). Some differences in behavior may be anticipated depending on how density is defined. In both cases, the amount of space per individual is the same, but the number of possible interactions is different depending on how density is measured.

- The number of people located in a particular area within the classroom. This might take the form of looking at density in terms of the number of people engaging in specific activities (functional groups) at particular locations. The overall ratio of people/room size would then be less important than ratio of people to the area of activity.
- The distance between functional groups. This definition may be related to some of the physical arrangement variables described below, but could be measured in terms of actual distance between groups and the number of groups. For example, there is a difference between breaking a 30 person class into six groups versus two or three groups.
- The number of people in the entire school. This relates to the kind of work done by Barker, Gump, and Wicker on overall school size, student activity patterns, and self-concepts. It is useful for a different scale of analysis than the definitions appearing above.

Spatial Arrangements. For purposes of the bridging discussion, spatial arrangements were considered from two perspectives, variations that might occur within a particular classroom, and those that might occur within a school.

- Within classroom variations. Two types of within class forms of spatial arrangement are possible. One is in terms of the overall architectural configuration or shape of the room itself (e.g., round, square, rectangle, L-shaped). A second is a function of the arrangement of objects and furnishings within the classroom.

For example, one could arrange chairs and desks in rows rather than in circles or semi-circles or squares; file cabinets, book-cases and other objects may be used to define space by creating visual boundaries or to construct actual physical barriers.

- Within school variations. These variations, like the classroom variations considered above, are primarily a function of basic architectural design. Variations occur in the relationship of classrooms and other spaces (e.g., learning centers, cafeteria, etc.) to each other in terms of proximity and the types of linkages between them. For example, two rooms may be physically close but psychologically (and functionally) distant, as is the case when two rooms are located back to back with entrances on opposite sides (e.g., backyards in tract housing where the only entrance is from two different streets). Linkages might be defined in terms of characteristics like actual distance, functional distance (ease of access), and visual accessibility (two classrooms with no physical access to each other but visual access through glass walls, for example). Linkages might also be characterized by the micro-environmental characteristics within them (e.g., two hallways, but one with comfortable seating alcoves placed periodically within it versus hallways which serve primarily as a transportation network, with no special provisions for activities other than circulation). The variations are infinite in terms of particular environmental features, but could be grouped into basic categories (e.g., multi-purpose vs. single-purpose links; open plan vs. traditional; visual access vs. visual barrier).

Definition of (Some) Observable Behaviors. To conceptualize what occurs in teacher-student learning groups, the concept of *functional segments* has been developed. This concept organizes the many activities which make up the complex behavior of teaching. The teaching process seems to involve both the enactment of direct instructional, recreational, and administrative activities as well as the managerial tasks of getting the materials, etc., ready for the activity (preparation) and getting the people who are to engage in the activity into place (transition). These constitute three functional segments of teaching, and the physical environment may affect the specific ways in which these segments are carried out as well as their duration and sequencing.

For example, the spatial arrangements of functional areas should have direct implications for transition time and hence, opportunities for social contact, deviance, sanctioning, etc. In addition to the effect on available task time, social contact may have important effects on the social relationships that develop between the teacher and students and among students.

Given the same intended activities, a transition/preparation/activity segment may look quite different under different physical conditions. For example, the patterns of behavior and time usage may vary in schools in which learning centers are in the same room, as opposed to schools in which learning centers are placed in different rooms. By observing the physical environment parameters and functional segments which conceptually and definitionally include the individual activity structures of recitation, class tasks and multi-task and the preparation of transition activities, the relationship of classroom activity and the surrounding environment should become clearer.

Of the many possible dimensions of observation, several which appear promising are: (1) patterns of movement (people and objects); (2) space utilization; and (3) certain human interactions.

Patterns of Movement. Movement of both people and objects may be of interest.

- People. The onset, frequency, duration, and patterns of students' and teacher's movement are of interest particularly as they occur within the different *functional segments* such as transition, preparation, and activities. Movement may be defined in terms of walking, body position, or other micro-behavioral movements such as "poking" others, fidgeting, etc. The selection of this behavioral variable is rooted in the non-verbal behavior literature which suggests that such behaviors are good indications of stress, fatigue, interest, etc. The value lies in the possibility that movement(s) may differ under different physical environment conditions, thus providing some behavioral standards of appropriate behavior that may be different from standards based on a single type of activity under one type of environmental condition. For example, student movement in and out of work stations may be the norm for some activities and some environmental conditions (such as individual task activities under high density) and should not be considered "deviant" because it contrasts with the kinds of movement patterns considered "normal" and appropriate for recitation activities under conditions of low density.
- Object. Object movement is closely related to space utilization. Under object movement, one would look for the temporary use of objects under particular classroom activity and environmental conditions (e.g., moving a desk or chair away from a circle, moving a bookcase to block out the sight of other students while

engaging in a specific activity, moving tables around from one part of the room to another as activities change). Object movement is an on-going expression of adaptation to both changing activity patterns and constant and changing environmental conditions.

Space Utilization. Space utilization incorporates an analysis of the overall pattern of use of the entire classroom (or building) environment, including the enduring pattern of use of chairs, tables, dividers, functional areas in terms of the number of people using them, how they are used, when they are used, for what purposes (may be different from intended purposes), and the classroom space and the objects and furnishings within it. To the extent that object movement follows recurrent patterns (under some conditions, chairs are always moved, etc.), these movements would also surface under space utilization.

Human Interaction. A variety of categories can be used to characterize human interaction. No attempt was made to provide an exhaustive list of possible descriptors. However, in looking at any social relationships several facets of interaction become readily apparent and relevant to developing an ecological theory of teaching.

- What is the nature of direct social contact? This is the who, where, when, how often, and for what purpose of descriptive categorization of interaction.
- What is the nature of indirect social contact? Vicarious experiences can also build social ties and have interaction effects. Therefore, the visibility among different individuals and groups should be examined.

- The mechanisms for choice and decision-making are important factors in social interaction for they set some of the parameters for social control and interpersonal exchange that shape social bonding and interaction.
- Rule setting and social sanctioning characterize the nature of exchanges and the boundary conditions for social interaction.
- Evaluation--both interpersonal and self--are inherent parts of social interaction.

It would seem that most types of social relationships (authority, cooperation/competition, friendship, aggression, pro-social behavior, etc.) can be typified in terms of different patterns of these behavioral factors.

Within the conceptual framework presented above, two guided questions are proposed to direct future inquiry into the relationship of the physical environment and the interaction(s) of the teacher-student learning group. These are:

1. How will the physical parameters of the school/class environment affect the proportion of different types of activities that occur and the nature of the activity structure? In what ways will the physical environment shape the possible (real and perceived) activities that can be carried out?
2. How will the physical parameters influence the rate, frequency, and type of interaction (behavior) within any one of the functional segments of class time as well as influence the structure (sequencing and duration) of the functional segments? How does the physical environment shape behavior (along with the activity structure) while the activity is

being enacted? For example, do particular seating patterns have different effects on teacher and student or peer interaction during recitation?

Relevant Methodological Concerns and Procedures

As suggested within the above conceptual framework, there are a plethora of variables and their interrelationships to be investigated in building an ecological view of teaching. As a starting point, therefore, it is advisable to think of mini-studies linking different variables in various ways in order to build and test several possible ecological theo*ries* of teaching rather than to envision a research design addressing theory as only one single, grand theory. The individual choice of an operationalized research design is much a matter of task and intuition. Building upon the guiding research questions proposed above, Drs. Becker and Bossert presented two topics for inquiry.

First, it is interesting to note that the teachers who responded to the Dawson, Tikunoff, and Ward working paper overwhelmingly listed physical characteristics as important shapers of their teaching. One should be able to examine how the *perceived* physical environment affects a teacher's plans or his or her conceptions of possibilities in selecting teaching strategies, given certain physical properties of the school and classroom. It would be interesting, for example, to test whether room size determines differentiation of instruction. One might hypothesize that the larger the room in which a teacher taught, the more differentiated instructional techniques would be used. If this proved to be the case, then one could examine the classrooms of deviant teachers--ones who demonstrated that a highly differentiated instructional system could be used in a small area--and compare classroom interaction patterns, sequencing, and the like to determine what these deviant teachers have done

(if anything) to adapt to the existing space parameters. Such a study would elucidate how teachers perceive and deal with the effect of physical parameters in their teaching.

A second study could focus on the observed relationship of the physical environment and the classroom activity structure in the shaping of student and teacher behavior. In this inquiry, one would identify schools or classrooms with similar activity structures (both in the general configuration of functional segments and the specific activity forms used--e.g., learning centers with groups of children using them in a serial fashion) but which have dissimilar physical properties (e.g., learning centers in larger open space settings versus learning centers in different rooms which are separated by walls and corridors). By comparing patterns of movement, space utilization and interaction patterns, the effects of the physical environment on classroom life would become clearer. Under conditions of high density, one may find that the proportion of recitation increases, but that this is true only in rectangular rooms. In rooms with spatial variation, such as loft spaces and well-defined multiple activity modes, (e.g., with physical boundaries), conditions of high density may not influence the structure of activities because the spatial arrangement works against centralization or conveys the message to teacher and students that learning in subgroups is expected and appropriate. Further, besides affecting the overall pattern of activities within the class, the physical parameters may impact on the activities themselves once they are enacted. For example, under conditions of high density student movement may be greatly increased for multiple-task activities within classrooms of slight shape variation while decreasing or remaining constant in classrooms of high shape variation.

Physical parameters also might impact differently on other behaviors, depending on the "functional segment." Open classrooms with high variation in the physical environment may result in high movement (for teachers) in preparation and transition periods in comparison to low variation classes in which the environment is more uniform and teachers are possibly less mobile. On the other hand, the overall movement or time spent in controlling behavior ("desist" behaviors) may be less than in low variation classes because once set up, the children are able to concentrate more on the activity (pent up energy is released in movement during transition periods). These ideas are not meant as specific hypotheses, but rather to suggest the kinds of relationships between physical variables and behavioral variables that are envisioned for study. Moreover, one could investigate whether there are different rule systems in the different schools/classrooms; different opportunities for peer interaction; different rates of deviant behavior and sanctioning. An interesting focus to these questions might be found in what happens during the transitional times (between task engagements) at the learning sites or centers.

When operationalizing research into questions such as those listed herein, comparisons within and between the physical environments of schools are unlikely to be made on the basis of "ideal" types; that is, ones in which all features are identical except for the one in which variation is sought. The goal should be to identify the physical parameters at the level considered most likely to affect the behavior of interest and to define the architectural variation at its most basic level (e.g., visual access vs. no visual access) with the specific way in which this is accomplished probably taking a number of forms.

To conduct observational field research into these questions, some form of "behavioral mapping" could be used in which a floor plan of the classroom

marked with relevant architectural details, furnishings and other objects is used as a base for indicating who is doing what, where, when, and with whom. Codes for user types, activity types, movement and its direction might be used to record the behavior observed. Gross motor activities such as walking, moving to a part of a room, rearranging a piece of furniture, could be measured by one or more observers. For questions requiring the notation of micro-behavioral non-verbal behaviors, videotape recording probably would be required, since no single observer could record all of the classroom behavior simultaneously.

Once data had been collected and analyzed regarding the relationship of the physical parameters of the classroom and the observable behaviors; further analysis could investigate the relationship with traditional outcome measures (e.g., academic achievement, norm learning, perception of self and others as learner, friend, citizen, moral actor, etc.). In such a study, the observable behavior which has been considered as the dependent variable in the preceding studies of the impact of physical parameters becomes the independent variable in a study of traditional school outcomes (which are the dependent variables under consideration).

A Final Note

At the conclusion of the theoretical discussion summarized above, both Drs. Bossert and Becker expressed the desire to collaborate on small scale observational mini-studies in order to generate hypotheses based on observation rather than speculation. It is hoped that these can be arranged in the near future with staff of the Far West Laboratory participating.

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